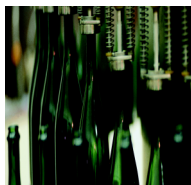


LISTEN.
THINK.
SOLVE.SM

E3 and E3 Plus Solid-State Overload Relay



Quick Start Guide

(Bulletins 193 and 592)

ATTENTION

This guide does not replace the User Manual, publication 193-UM002_-EN-P, and is intended for qualified service personnel responsible for setting up and servicing these devices. You must have previous experience with and a basic understanding of electrical terminology, configuration procedures, required equipment, and safety precautions. The user manual can be downloaded from <http://literature.rockwellautomation.com>.

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes, and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Rockwell Automation publication SGI-1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control (available from your local Allen-Bradley distributor), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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General Precautions

In addition to the specific precautions listed throughout this manual, the following general statements must be observed.

IMPORTANT

The purpose of this publication is to serve as a guide for proper installation. The National Electrical Code and any other governing regional or local code overrules the information in this publication. A hazard of personal injury/equipment damage exists if codes are ignored during installation. Rockwell Automation cannot assume responsibility for the compliance or proper installation of the E3 Overload Relay or associated equipment.

IMPORTANT

Only personnel familiar with the E3 Overload Relay and associated machinery should plan to install, start up, and maintain the system. Failure to comply may result in personal injury/equipment damage.

IMPORTANT

An incorrectly applied or installed E3 Overload Relay can result in damage to the components or reduction in product life. Wiring or application errors, such as incorrectly configuring the FLA Setting, supplying incorrect or inadequate DeviceNet supply voltage, connecting an external supply voltage to the input or thermistor terminals, or operating/storing in excessive ambient temperatures may result in malfunction of the E3 Overload Relay.

IMPORTANT

The E3 Overload Relay contains ESD (electrostatic discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8200-4.5.2, *Guarding Against Electrostatic Damage*, or any other applicable ESD protection handbook.

Introduction

Follow these steps to successfully commission the E3 Overload Relay:

Table 1: Commissioning Procedure

Step	Description
1	Hardware Installation
2	Wiring Installation <ul style="list-style-type: none"> – Typical Motor Connections – External Current Transformer Applications (193-EC_ZZ or 592-EC_ZZ) – External Ground Fault Sensor Applications (193-EC3_ , 592-EC3_ and 193-EC5_ , 592-EC5_)
3	DeviceNet Commissioning
4	Setup Requirements <ul style="list-style-type: none"> Setup for Bulletin 193 or 592-EC1/EC2/EC3/EC5 Overload Relay <ul style="list-style-type: none"> – Protective Trip and Warning Summaries – Parameter Group Listing Setup for Cat. No. 193-EC4 Current Monitor Relay <ul style="list-style-type: none"> – Trip and Warning Summaries – Parameter Group Listing

Hardware Installation

The following figures illustrate the starter assembly instructions.

Starter Assembly Instructions

Figure 1: 100-C09...C43 Starter Assembly Instructions (for use with Cat. Nos. 193-EC__B and -EC__D)

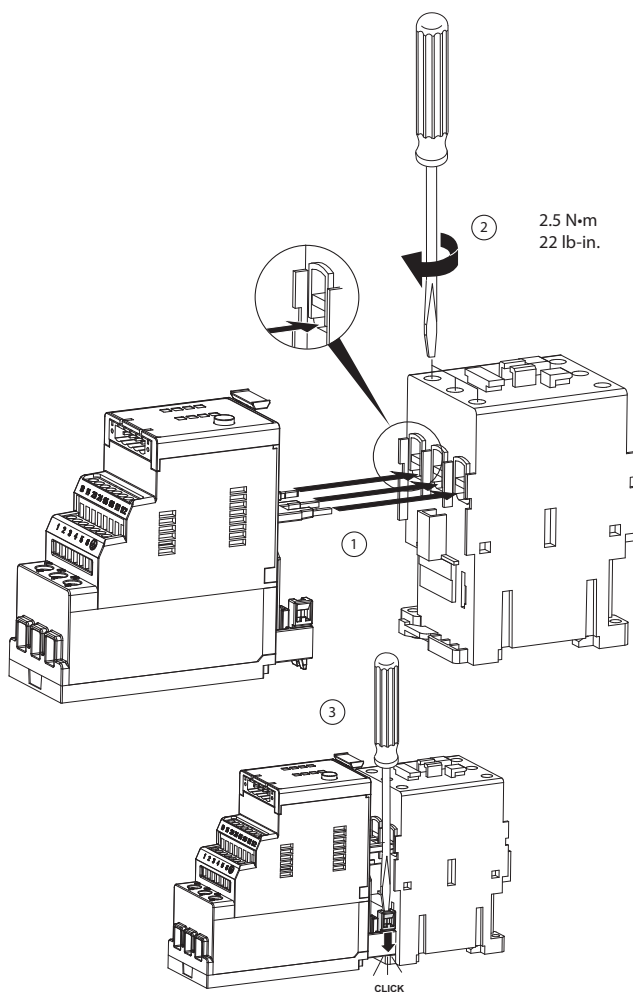


Figure 2: 100-C60...C85 Starter Assembly Instructions (for use with Cat. No. 193-EC__E).

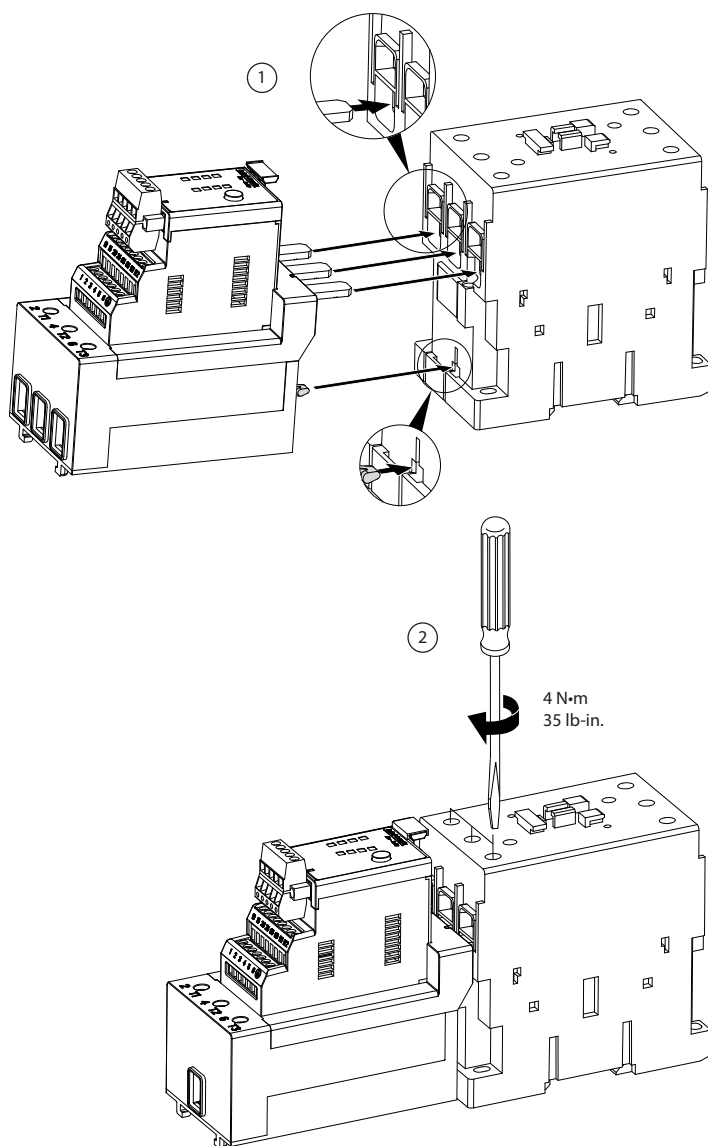
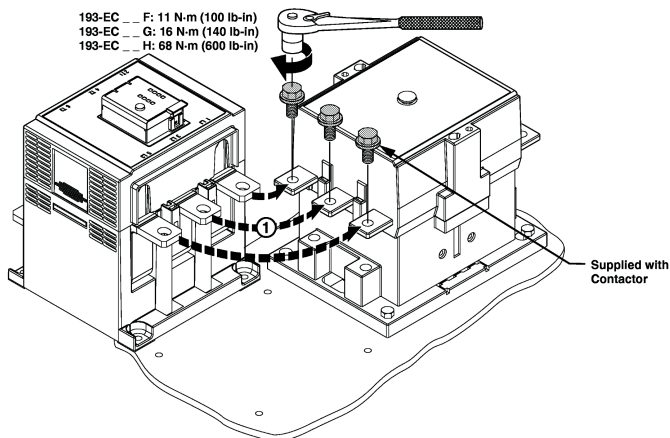


Figure 3: 100-D95...D860 Starter Assembly Instructions (for use with Cat. Nos. 193-EC __F, 193-EC __G, and 193-EC __H).

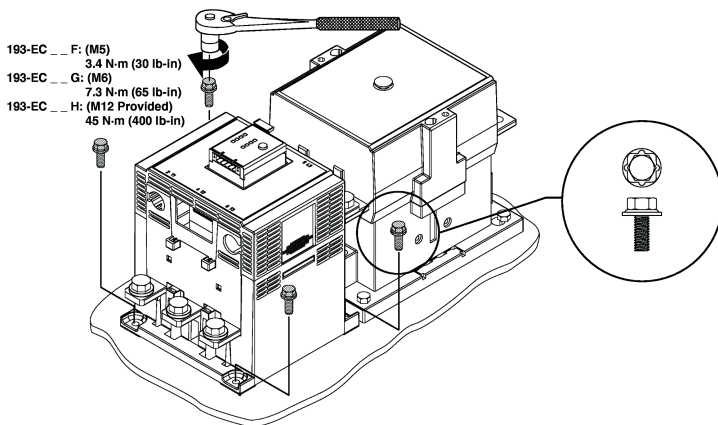
1



ATTENTION: Do not lift or handle product by cover alone.



2



Wiring Installation

Typical Motor Connections

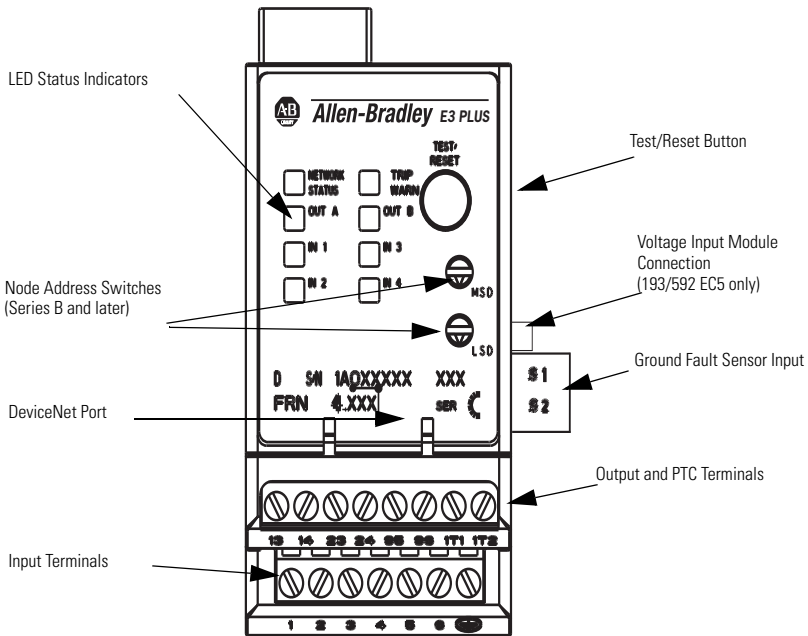
Refer to the product nameplate or user manual for power lug termination information including:

- Terminal wire size and torque specifications
- Maximum wire lengths
- Lug kit catalog numbers (108...1250 A)

For reliable input signal processing, input wiring should be routed in raceways separate from power cabling.

Terminal Designations


Figure 4: E3 and E3 Plus Feature Overview



Control Terminals

The following table defines the E3 Overload Relay control terminal designations.

Table 2: Control Terminal Designation

Terminal Designation	Reference	Description
1	IN 1	General-purpose sinking input number 1
2	IN 2	General-purpose sinking input number 2
3	IN 3	General-purpose sinking input number 3 ①②
4	IN 4	General-purpose sinking input number 4 ①②
5	V+	+24V DC supply for inputs
6	V+	
7	IN 5	General-purpose sinking input number 5 ②
8	IN 6	General-purpose sinking input number 6 ②
	End	Earth Ground ③
13/14	OUT A	Output A
23/24	OUT B	Output B ①②
95/96	Trip Relay	Trip Relay
IT1/IT2	PTC	Thermistor (PTC) input ①④
S1/S2	—	External ground fault sensor input ②⑤

① Features are available only with the E3 Plus Overload Relay (cat. nos. 193/592-EC2 and 193/592-EC3).

② Available only on cat. nos. 193/592-EC5_ _.

③ An earth ground connection to this terminal will assist in obtaining compliance with electromagnetic compatibility requirements.

④ The use of shielded cable is recommended for the positive PTC thermistor circuit to assist in obtaining compliance with electromagnetic compatibility requirements.

⑤ Available only on cat. nos. 193/592-EC3_ _ and 193/592-EC4_ _.

DeviceNet Terminals

The following table defines the DeviceNet connector terminal designations.

Table 3: DeviceNet Terminal Designation

Terminal	Signal	Function	Color
1	V-	Common	Black
2	CAN_L	Signal Low	Blue
3	Drain	Shield	Non-insulated
4	CAN_H	Signal High	White
5	V+	Power Supply	Red

Grounding

The following grounding recommendations are provided to ensure electromagnetic compatibility compliance during installation:

- The earth ground terminal of the E3 Overload Relay shall be connected to a solid earth ground via a low-impedance connection
- Installations employing an external ground fault sensor shall ground the cable shield at the sensor with no connection made at the E3 Plus Overload Relay
- The PTC thermistor cable shield shall be grounded at the E3 Plus Overload Relay with no connection made at the opposite end

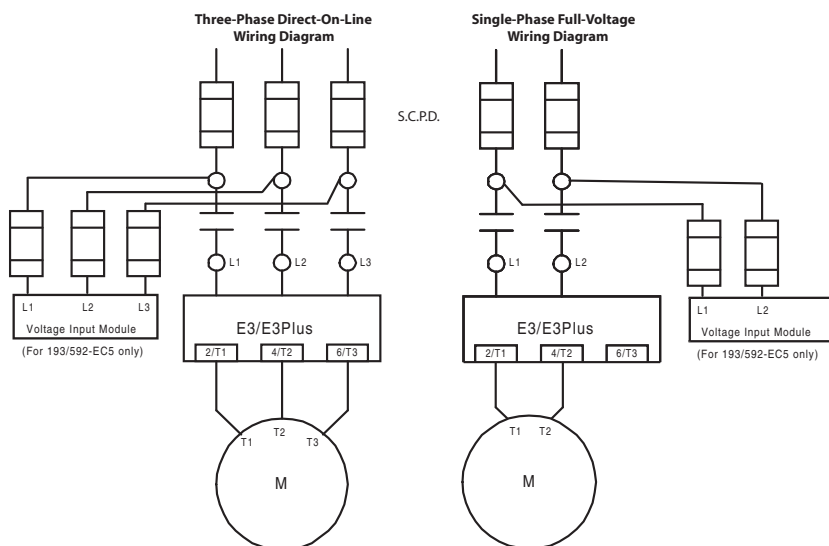
Wiring Diagrams

ATTENTION



When working on energized circuits, do not rely on the voltage and current information provided by the E3 and E3 Plus for personal safety. Always use a portable voltage or current measurement device and measure the signal locally.

Figure 5: Three-Phase D.O.L & Single-Phase Wiring Diagrams



IMPORTANT

Parameter 27, *Single/Three Ph*, should be set to single-phase for single-phase devices and three-phase for three-phase devices.

IMPORTANT

In single-phase devices, traditional single-phase wiring (connecting T2 to L3) will result in a vector imbalance of current flowing through the E3 Plus Overload Relay. This will result in inaccurate ground fault reporting and protection.

External Current Transformer Application (Cat. No. 193-EC_ZZ)

E3 and E3 Plus Overload Relays (Cat. No. 193-EC_ZZ) are designed for use with separately mounted, customer-supplied current transformers (CTs) as required in higher-current applications. The FLA setting range is 9...5000 A for these units, with a legal setting range per the user's manual. Parameter 78, *CT Ratio*, is provided for setting the current transformer ratio to be installed.

Current Transformer Specifications

The 193-EC_ZZ Overload Relays are intended for use with a CT having a secondary current rating of 5 A. The installer shall provide one CT for each motor phase and shall connect the CT secondary leads to the appropriate E3 Overload Relay power terminals as shown in Figure 7: on page 13. The CT shall have an appropriate ratio rating as detailed in the user's manual. Additionally, the CT shall be selected to be capable of providing the required VA to the secondary load, which includes the E3 Overload Relay burden of 0.1 VA at the rated secondary current and the wiring burden.

Finally, the CT shall be rated for *protective relaying* to accommodate the high inrush currents associated with motor startup and shall have an accuracy of $\leq \pm 2\%$ over its normal operating range.

ANSI (USA)	Class C5 B0.1
CSA (Canada)	Class 10L5
IEC (Europe)	5 VA Class 5P10

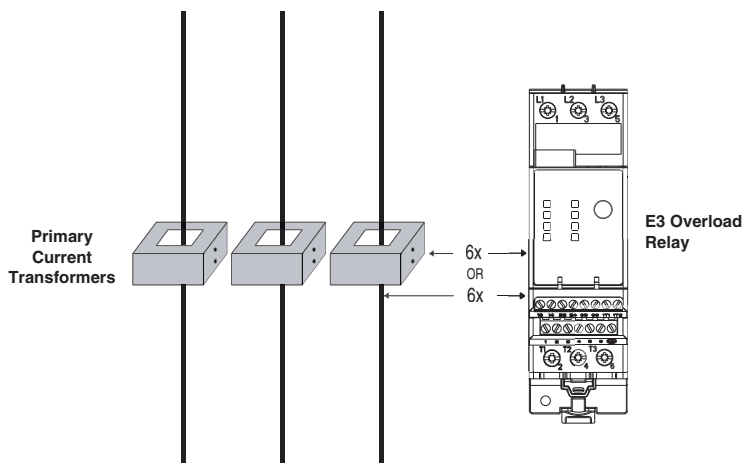
IMPORTANT

The improper selection of a current transformer can result in the E3 Overload Relay reporting inaccurate motor operational data and possible motor damage. The selected current transformer must be rated for protective relaying applications.

Installation Instructions

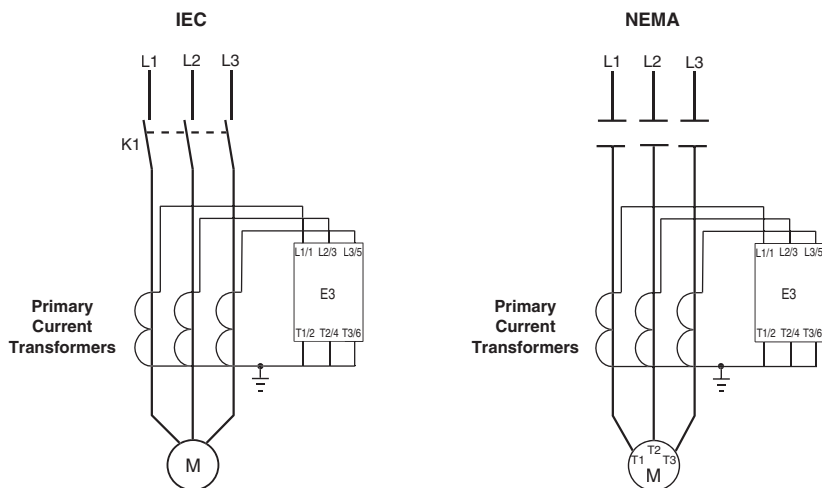
Cat. No. 193-EC_ZZ Overload Relays are designed to be installed in cat. no. 193-ECPM2 panel mount adapters and connected to separately mounted current transformers. For a panel mount adapter assembly, refer to the instructions included with the panel mount adapter. The E3 Overload Relay must be mounted a distance equal to, or greater than, six times the cable diameter (including insulation) from the nearest current-carrying conductor or current transformer. For applications employing multiple conductors per phase, the diameter of each cable should be added and multiplied by six to determine the proper placement distance for the E3 Overload Relay.

Figure 6: Cat. No. 193-EC_ZZ Overload Relay Mounting Placement



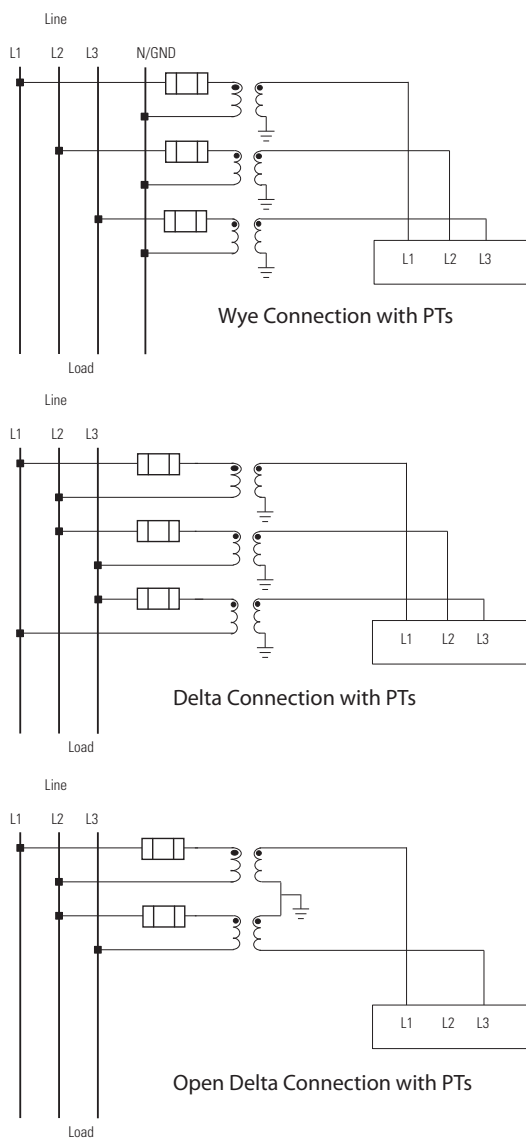
IMPORTANT

Placement of the E3 Overload Relay closer than the recommended distance of six times the cable diameter may compromise its current reporting and protection capabilities.

Figure 7: External CT Connection Diagrams


External Potential (Voltage) Transformer Application (Cat. No. 193/592-EC5_ _)

The E3 Plus Overload Relay Catalog Number 193/592-EC5_ _ can be used with external step-down potential transformers (PTs). The PT ratio is programmed into the E3 Plus by entering the primary winding rating into Parameter 289, *PT Pri*, and the secondary winding rating into Parameter 290, *PT Sec*. The voltage mode is also programmed into the E3 Plus by selecting the appropriate mode in Parameter 156, *Volt Mode*. The E3 Plus will support Wye, Delta, and Open Delta voltage modes with potential transformers.

Figure 8: External PT Connection Diagrams

External Ground Fault Sensor Application

(Cat. Nos. 193/592-EC3__, 193/592-EC4__, and 193/592-EC5__)

Cat. Nos. 193/592-EC3__, 193/592-EC4__, and 193/592-EC5__ E3 Plus Overload Relays are intended to provide ground fault protection when used with the cat. no. 193-CBCT__ external ground fault (core balance) sensor. The ground fault sensor mounts separately from the E3 Plus Overload Relay and must be placed within three meters of the relay. The customer-supplied cable for wiring the ground fault sensor to the E3 Plus Overload Relay should meet the specifications outlined in Table 1.9 on page 15.

Table 1.9 Ground Fault Sensor Terminals (S1 and S2)

Wire type	Shielded, twisted pair
Cross section	0.2...4.0 mm ² (#24...12 AWG)
Torque	0.55 N•m (5 lb-in.)

Power Cable Installation Instructions

1. All power cables (including the neutral when used) must pass through the sensor window. The equipment ground conductor (the conductor used to carry the non-current-carrying metal parts of equipment, as defined by Article 100 of the NEC), must **not** pass through the sensor window.
2. The power cables through the sensor window should be straight, tightly bundled, centered in the window, and perpendicular to the sensor for a length equal to, or greater than, six times the cable diameter (including insulation) from the sensor.
3. All other conductors with available currents in excess of 1,000 A should be placed a distance equal to, or greater than, six times the cable diameter (including insulation) from the sensor.
4. The power cables of the branch circuit to be protected by the E3 Plus Overload Relay must not be grounded on the load side of the ground fault sensor.
5. If the power cables are enclosed in a conducting jacket, the jacket must be grounded on the line side of the sensor. The jacket must not pass through the sensor window, but must be cut at the window and joined with a conductor that passes outside the sensor window.
6. The power system may be solidly grounded or grounded through an impedance at its source as long as the impedance allows a magnitude of fault current to flow that is within the 1...5 A operational range of the E3 Plus Overload Relay (193/592-EC2__) or the 20 mA...5 A operational range of the E3 Plus Overload Relay (193/592-EC3__, 193/592-EC4__, and 193/592-EC5__).

Figure 10: Ground Fault Sensor Mounting Placement

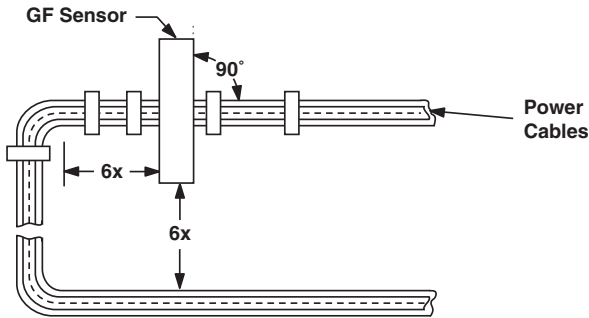


Figure 11: Power Cable Configuration — Two Cables per Phase

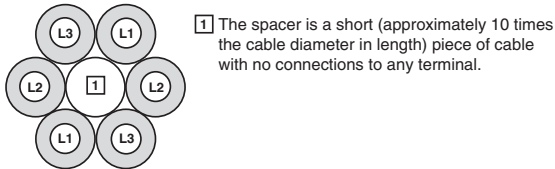
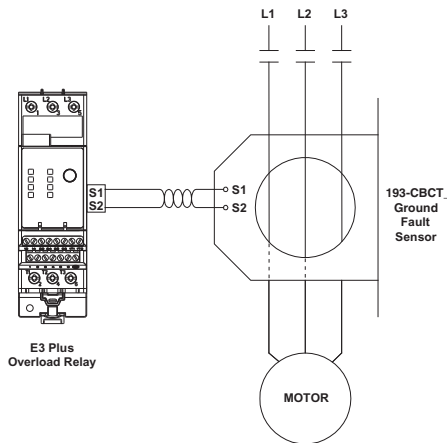


Figure 12: Ground Fault Sensor Wiring to the E3 Plus Overload Relay



IMPORTANT

The shield of the twisted pair cable must be connected to earth ground at the sensor, with no connection made at the E3 Plus Overload Relay.

DeviceNet Node Commissioning

Overview

E3 Overload Relays are shipped with a default software node address (MAC ID) setting of 63 and the data rate set to Autobaud. Each device on a DeviceNet network must have a unique node address which can be set to a value from 0...63.

Keep in mind, most DeviceNet systems use address 0 for the master device (scanner) and node address 63 should be left vacant for introduction of new slave devices. The node address and data rate for series B or later, E3 Overload Relays can be changed using software or by setting the hardware switches that reside on the front of each unit. While both methods yield the same result, it is good practice to choose one method and deploy it throughout the system.

IMPORTANT

The following recommendations are intended to ensure a trouble-free startup and operation:

1. Use the node commissioning tool in RSNetWorx or the DeviceNet configuration terminal (cat. no. 193-DNCT) when modifying the E3 node address. Do not use the *General* tab found in the product window in RSNetWorx. The node commissioning tool ensures the device goes through a hard reset and requires the user to upload the most current parameter information from the device prior to making configuration changes.
 2. Ensure you have the most current configuration information prior to saving an RSNetWorx configuration file.
 3. If you intend to employ the ADR function of the DeviceNet scanner, ensure the device configuration is as you intend it BEFORE saving it to memory.
 4. Be aware the *Restore Device Defaults* button in RSNetWorx will reset the E3 Overload Relay node address setting to 63. For Series B or later devices, the hardware node address switches take precedence over the software node address setting.
-

Figure 13: Node Address Switches

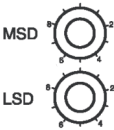


Table 2: Node Address Setting

Switch Settings	Description
0...63	The node address setting is determined by the switch values when set in this range.
64...99	For switch settings in this range, the node address setting is determined by the software setting using the RSNetWorx for DeviceNet configuration tool.
99	Factory default setting.

Note: For node address switch values in the range of 0...63, cycle power to the E3 Overload Relay to initialize the new setting.

Setup Requirements

Setup for Cat. Nos. 193/592-EC1/EC2/EC3/EC5 Overload Relays

After the E3 Overload Relay is installed according to the guidelines specified in this manual, apply power to the overload relay’s DeviceNet connector. After applying power, the following sequence should occur:

1. The Trip relay should close 2.35 seconds later and the TRIP/WARN LED will not flash (unless a Non-Volatile Fault previously existed or a fault condition is present).
2. At the same time, the NETWORK STATUS LED should flash green for approximately two seconds, then red for a 1/4 second. If autobaud is enabled and the E3 Overload Relay is connected to an active network, the green LED will continue to flash once the baud rate has been determined. If the E3 Overload Relay is not connected to an active network, the LED will not continue to flash.
3. Once the E3 Overload Relay has been allocated by a master, the NETWORK STATUS LED will turn solid green.

After being powered up, use the DeviceNet Configuration Terminal (Cat. No. 193-DNCT) in order to set up the parameters. There are five basic parameters that need to be established before using the protective functions. These parameters are listed under the OVERLOAD SETUP menu and include: Single/Three Phase, Full Load Current (FLA) Setting, Trip Class, Overload/PTC Reset mode, and Overload Reset Level. (Note: You will need to program additional parameters when customer-supplied CTs are used.)

Once these parameters are set, the E3 Overload Relay is functional. Use the ADVANCED SETUP menu to set other parameters per the specific application requirements.

Protective Trip/Warning Summaries & Parameter Group Listing (Cat. Nos. 193/592-EC1/EC2/EC3/EC5)

Table 3: Trip Summary

Trip Function	Trip Enable Factory Default	Trip Level Settings		Trip Delay Settings		Inhibit Time Settings ①	
		Range	Default	Range	Default	Range	Default
Overload	Enabled	②	②	Trip Class 5...30	Trip Class 10	—	—
Phase Loss	Enabled	③	③	0.1...25.0 s	1.0 s	0...250 s	0 s
Ground Fault (193/592-EC2)	Disabled	Internal 1...5 A	2.5 A	0.0...25.0 s	0.5 s	0...250 s	10 s
Ground Fault (193/592-EC3)	Disabled	External 0.02...5 A ④	2.5 A	0.0...25.0 s	0.5 s	0...250 s	10 s
Stall	Disabled	100...600% ⑤	600% ⑤	0...250 s ⑤	10 s ⑤	—	—
Jam	Disabled	50...600%	250%	0.1...25.0 s	5.0 s	0...250 s	10 s
Underload	Disabled	10...100% FLA ⑥	50%	0.1...25.0 s	5.0 s	0...250 s	10 s
PTC	Disabled	—	—	—	—	—	—
Current Imbalance	Disabled	10...100%	35%	0.1...25.0 s	5.0 s	0...250 s	10 s
Comm Fault	Enabled	—	—	—	—	—	—
Comm Idle	Disabled	—	—	—	—	—	—
Remote Trip	Disabled	—	—	—	—	—	—
Voltage Input Module Hardware Fault ⑦	Disabled	—	—	—	—	—	—
Undervoltage L-L ⑦	Disabled	0...65535	100	0.1...25.0 s	1.0 s	0...250 s	10 s
Overvoltage L-L ⑦	Disabled	0...65535	500	0.1...25.0 s	1.0 s	0...250 s	10 s
Voltage Unbalance ⑦	Disabled	0...100	75	0.1...25.0 s	1.0 s	0...250 s	10 s
Phase Rotation ⑦	Disabled	1...2	1	—	—	0...250 s	10 s
Under Frequency ⑦	Disabled	0...250	57	0.1...25.0 s	1.0 s	0...250 s	10 s
Over Frequency ⑦	Disabled	0...250	63	0.1...25.0 s	1.0 s	0...250 s	10 s
Under Real Power ⑦	Disabled	0...32767		0.1...25.0 s	1.0 s	0...250 s	10 s
Over Real Power ⑦	Disabled	0...32767		0.1...25.0 s	1.0 s	0...250 s	10 s

Table 3: Trip Summary

Trip Function	Trip Enable Factory Default	Trip Level Settings		Trip Delay Settings		Inhibit Time Settings ❶	
		Range	Default	Range	Default	Range	Default
Under Consumed kVAR ❷	Disabled	0...32767		0.1...25.0 s	1.0 s	0...250 s	10 s
Over Consumed kVAR ❷	Disabled	0...32767		0.1...25.0 s	1.0 s	0...250 s	10 s
Under Generated kVAR ❷	Disabled	-32767...0		0.1...25.0 s	1.0 s	0...250 s	10 s
Over Generated kVAR ❷	Disabled	-32767...0		0.1...25.0 s	1.0 s	0...250 s	10 s
Under Power kVA ❷	Disabled	0...32767		0.1...25.0 s	1.0 s	0...250 s	10 s
Over Power kVA ❷	Disabled	0...32767		0.1...25.0 s	1.0 s	0...250 s	10 s
Under Power Factor Lagging ❷	Disabled	-100...0	-90	0.1...25.0 s	1.0 s	0...250 s	10 s
Over Power Factor Lagging ❷	Disabled	-100...0	-95	0.1...25.0 s	1.0 s	0...250 s	10 s
Under Power Factor Leading ❷	Disabled	0...100	90	0.1...25.0 s	1.0 s	0...250 s	10 s
Over Power Factor Leading ❷	Disabled	0...100	95	0.1...25.0 s	1.0 s	0...250 s	10 s

❶ The inhibit time setting parameters are applicable to both the trip and warning functions.

❷ FLA Setting range and default values are dependent upon the current rating of the product. See the user manual for more information.

❸ Phase loss trip level is factory-set at a current imbalance greater than or equal to 100% and is not user-adjustable.

❹ Must use Ground Fault Sensors (Cat. No. 193-CBCT_).

❺ Stall protection is only applicable during the motor starting sequence. If any phase of current falls below the programmed Stall Trip Level, stall protection is disabled.

❻ 50...100% for devices with FRN 1.003 and earlier.

❼ Available on 193/592-EC5 only.

Table 4: Warning Summary

Warning Function	Warning Enable Factory Default	Warning Level Settings		Inhibit Time Settings ❶	
		Range	Default	Range	Default
Overload	Disabled	0...100%❷	85%	—	—
Phase Loss	—	—	—	—	—
Ground Fault (193/592-EC2)	Disabled	Internal 1...5 A	2.0 A	0...250 s	10 s
Ground Fault (193/592-EC3)	Disabled	External 0.02...5 A ❸	2.0 A	0...250 s	10 s
Stall	—	—	—	—	—
Jam	Disabled	50...600%	150%	0...250 s	10 s
Underload	Disabled	10...100%❹	70%	0...250 s	10 s
Thermistor (PTC)	Disabled	—	—	—	—
Current Imbalance	Disabled	10...100%	20%	0...250 s	10 s
Comm Fault	Disabled	—	—	—	—
Comm Idle	Disabled	—	—	—	—
Voltage Input Module Hardware Fault ❺	Enabled	—	—	—	—
Under Voltage L-L ❺	Disabled	0...65535	400	0...250 s	10 s
Over Voltage L-L ❺	Disabled	0...65535	490	0...250 s	10 s
Voltage Unbalance ❺	Disabled	0...100	85	0...250 s	10 s
Phase Rotation ❺	Disabled	1...2	1	0...250 s	10 s
Under Frequency ❺	Disabled	0...250	58	0...250 s	10 s
Over Frequency ❺	Disabled	0...250	62	0...250 s	10 s
Under Real Power ❺	Disabled	0...32767		0...250 s	10 s
Over Real Power ❺	Disabled	0...32767		0...250 s	10 s
Under Consumed kVAR ❺	Disabled	0...32767		0...250 s	10 s
Over Consumed kVAR ❺	Disabled	0...32767		0...250 s	10 s
Under Generated kVAR ❺	Disabled	-32767...0		0...250 s	10 s
Over Generated kVAR ❺	Disabled	-32767...0		0...250 s	10 s
Under Power kVA ❺	Disabled	0...32767		0...250 s	10 s
Over Power kVA ❺	Disabled	0...32767		0...250 s	10 s
Under Power Factor Lagging ❺	Disabled	-100...0	-95	0...250 s	10 s
Over Power Factor Lagging ❺	Disabled	-100...0	-90	0...250 s	10 s
Under Power Factor Leading ❺	Disabled	0...100	95	0...250 s	10 s
Over Power Factor Leading ❺	Disabled	0...100	90	0...250 s	10 s

❶ The inhibit time setting parameters are applicable to both the trip and warning functions.

❷ Overload warning setting is entered as a percentage of the thermal capacity utilized.

❸ Must use Ground Fault Sensors (Cat. No. 193-CBCT_).

❹ 50...100% for devices with FRN 1.003 and earlier.

❺ Available on 193/592-EC5 only.

Table 5: Parameter Group Listing

Monitor Params	Overload Setup	Reset/Lock	Advanced Setup	DeviceNet Setup	Output Setup	DeviceLogix
1 L1 Current	27 Single/ Three Ph	26 Trip Reset	24 Trip Enable	55 AutoBaudEnable	65 OutA Pr FitState	79 Comm Override
2 L2 Current	28 FLA Setting	53 Program Lock	25 Warning Enable	56 NonVol Baud Rate	66 OutA Pr FitValue	80 Network Override
3 L3 Current	29 Trip Class	54 Set to Defaults	27 Single/Three Ph	58 COS Mask	67 OutA DN FitState	81 Net outputs
4 Average Current	30 OL/PTC ResetMode	103 Test Enable*	28 FLA Setting	59 Output Assembly	68 OutA DN FitValue	82 Net Out COS Mask
5 L1 % FLA	31 OL Reset Level	104 Clear Queue*	29 Trip Class	60 Input Assembly	69 OutA DN IdlState	
6 L2 % FLA	78 CT Ratio		30 OL/PTC ResetMode	61 Assy Word0 Param	70 OutA DN IdlValue	
7 L3 % FLA			31 OL Reset Level	62 Assy Word1 Param	71 OutB Pr FitState	
8 Average % FLA			32 OL Warning Level	63 Assy Word2 Param	72 OutB Pr FitValue	
9 % Therm Utilized			33 PL Inhibit Time	64 Assy Word3 Param	73 OutB DN FitState	
10 GF Current			34 PL Trip Delay		74 OutB DN FitValue	
11 Current Imbal			35 GF Inhibit Time		75 OutB DN IdlState	
12 OL Time To Trip			36 GF Trip Delay		76 OutB DN IdlValue	
13 OL Time To Reset			37 GF Trip Level			
14 Trip Status			38 GF Warn Level			
15 Warning Status			39 Stall Enbld Time			
16 Trip Log 0			40 Stall Trip Level			
17 Trip Log 1			41 Jam Inhibit Time			
18 Trip Log 2			42 Jam Trip Delay			
19 Trip Log 3			43 Jam Trip Level			
20 Trip Log 4			44 Jam Warn Level			
21 Device Status			45 UL Inhibit Time			
22 Firmware			46 UL Trip Delay			
23 Dev Config			47 UL Trip Level			
90 Warn Log 0			48 UL Warn Level			
91 Warn Log 1			49 Ci Inhibit Time			
92 Warn Log 2			50 Ci Trip Delay			
93 Warn Log 3			51 Ci Trip Level			
94 Warn Log 4			52 Ci Warn Level			
95 Elapsed Time			78 CT Ratio			
96 Starts Counter			83 IN 1 Assignment			
97 Starts Available			84 IN 2 Assignment			
98 Time To Start			85 IN 3 Assignment			
			86 IN 4 Assignment			
			87 2-Spd Net Enable			
			88 2-Speed FLA Set			
			89 GF Trip Inhibit			
			99 Starts/Hour			
			100 Starts Interval			
			101 PM - # Starts			
			102 PM - Oper. Hours			
			105 GF Warn Delay			
			106 GF Sensing Range			

① Series C (FRN 4.00 and higher)

Table 6: Parameter Group Listing, Continued

Device Logix	TripWarn History ②	Trip Snapshot ②	Voltage Monitor ③	Voltage Setup ③	Power Monitor ③	Power Setup ③
79 Comm Override	132 Trip History 0	144 SS L1 Current	160 V Trip Status	156 Volt Mode	173 L1 Real Power	157 Power Scale
80 Network Override	133 Trip History 1	145 SS L2 Current	161 V Warn Status	158 V Trip Enable	174 L2 Real Power	225 PW Trip Enable
81 Net outputs	134 Trip History 2	146 SS L3 Current	162 L1-L2 Voltage	159 V Warn Enable	175 L3 Real Power	226 PW Warn Enable
82 Net Out COS Mask	135 Trip History 3	147 SS %TCU	163 L2-L3 Voltage	215 UV Inhibit Time	176 Total Real Power	241 UW Inhibit Time
	136 Trip History 4	148 SS GF Current	164 L3-L1 Voltage	216 UV Trip Delay	177 L1 Reactive Power	242 UW Trip Delay
	137 Warn History 0	149 SS L1-L2 Voltage	165 Ave Voltage L-L	217 UV Trip Level	178 L2 Reactive Power	243 UW Trip Level
	138 Warn History 1	150 SS L2-L3 Voltage	166 L1-N Voltage	218 UV Warn Level	179 L3 Reactive Power	244 UW Warn Level
	139 Warn History 2	151 SS L3-L1 Voltage	167 L2-N Voltage	219 OV Inhibit Time	180 Tot Reactive Power	245 UW Inhibit Time
	140 Warn History 3	152 SS Tot Real Pwr	168 L3-N Voltage	220 OV Trip Delay	181 L1 Apparent Power	246 OW Trip Delay
	141 Warn History 4	153 SS Tot kVAR	169 Ave Voltage L-N	221 OV Trip Level	182 L2 Apparent Power	247 OW Trip Level
	142 TripHistory Mask	154 SS Tot kVA	170 Volt Unbalance	222 OV Warn Level	183 L3 Apparent Power	248 OW Warn Level
	143 WarnHistory Mask	155 SS Total PF	171 Volt Frequency	223 Ph Rot Inhib Time	184 Tot Apparent Power	249 UVARC Inhibit Time
	299 V TripHist Mask		172 V Phase Rot	224 Ph Rot Trip	185 L1 PF	250 UVARC Trip Delay
	300 V WarnHist Mask			229 V UnhalInhib Time	186 L2 PF	251 UVARC Trip Level
	301 PW TripHist Mask			230 V UnbalTripDelay	187 L3 PF	252 UVARC Warn Level
	302 PW WarnHist Mask			231 V UnbalTripLevel	188 Total PF	253 OVARC Inhibit Time
				232 V UnbalWarnLevel	189 kWh 10E6	254 OVARC Trip Delay
				233 UF Inhibit Time	190 kWh 10E3	255 OVARC Trip Level
				234 UF Trip Delay	191 kWh 10E0	256 OVARC Warn Level
				235 UF Trip Level	192 kWh 10E-3	257 UVARG Inhibit Time
				236 UF Warn Level	193 kVARh Con 10E6	258 UVARG Trip Delay
				237 OF Inhibit Time	194 kVARh Con 10E3	259 UVARG Trip Level
				238 OF Trip Delay	195 kVARh Con 10E0	260 UVARG Warn Level
				239 OF Trip Level	196 kVARh Con 10E-3	261 OVARG Inhibit Time
				240 OF Warn Level	197 kVARh Gen 10E6	262 OVARG Trip Delay
				289 PT Pri	198 kVARh Gen 10E3	263 OVARG Trip Level
				290 PT Sec	199 kVARh Gen 10E0	264 OVARG Warn Level
					200 kVARh Gen 10E-3	265 UVA Inhibit Time
					201 kVARh Net 10E6	266 UVA Trip Delay
					202 kVARh Net 10E3	267 UVA Trip Level
					203 kVARh Net 10E0	268 UVA Warn Level
					204 kVARh Net 10E-3	269 OVA Inhibit Time
					205 kVAh 10E6	270 OVA Trip Delay
					206 kVAh 10E3	271 OVA Trip Level
					207 kVAh 10E0	272 OVA Warn Level
					208 kVAh 10E-3	273 UPFLG Inhibit Time
					209 kW Demand	274 UPFLG Trip Delay
					210 Max kW Demand	275 UPFLG Trip Level
					211 VAR Demand	276 UPFLG Warn Level
					212 Max VAR Demand	277 OPFLG Inhibit Time
					213 VA Demand	278 OPFLG Trip Delay
					214 Max VA Demand	279 OPFLG Trip Level
					227 PW Trip Status	280 OPFLG Warn Level
					228 PW Warn Status	281 OPFLD Inhibit Time
						282 OPFLD Trip Delay
						283 OPFLD Trip Level
						284 OPFLD Warn Level
						285 OPFLD Inhibit Time
						286 OPFLD Trip Delay
						287 OPFLD Trip Level
						288 OPFLD Warn Level
						291 Demand Period
						292 Num of Periods

③ Series C (FRN 5.00 and Higher)

● 193/592-EC5 Only

Setup for Cat. No. 193-EC4 Current Monitor Relay

After the E3 Plus Current Monitor Relay is installed according to the guidelines specified in this manual, apply power to the relay's DeviceNet connector. After applying power, the following sequence should occur:

1. The Trip relay should close 2.35 seconds later and the TRIP/WARN LED will not flash (unless a Non-Volatile Fault previously existed or a fault condition is present).
2. At the same time, the NETWORK STATUS LED should flash green for approximately two seconds, then red for a 1/4 second. If autobaud is enabled and the E3 Plus Current Monitor Relay is connected to an active network, the green LED will continue to flash once the baud rate has been determined. If the E3 Plus Current Monitor Relay is not connected to an active network, the LED will not continue to flash.
3. Once the E3 Plus Current Monitor Relay has been allocated by a master, the NETWORK STATUS LED will turn solid green.

After being powered up, use the DeviceNet Configuration Terminal (Cat. No. 193-DNCT) in order to set up the parameters. There are six basic parameters that need to be established before using the trip functions. These parameters are listed under the ADVANCED SETUP menu and include: L1 UC Trip Level, L2 UC Trip Level, L3 UC Trip Level, L1 OC Trip Level, L2 OC Trip Level, and L3 OC Trip Level. After the parameters have been configured, enable the specific trip bit as described in Table 7: for Parameter 24 (*Trip Enable*) to energize the relay when conditions are met.

Once these parameters are set, the E3 Plus Current Monitor Relay is functional. Use the ADVANCED SETUP menu to set other parameters per the specific application requirements.

Protective Trip/Warning Summaries & Parameter Group Listing (Cat. No. 193-EC4)

Table 7: Trip Summary

Trip Function	Trip Enable Factory Default	Trip Level Settings		Trip Delay Settings		Inhibit Time Settings	
		Range	Default	Range	Default	Range	Default
Ground Fault	Disabled	0.02...5 A	2.5 A	0.0...25 s	0.5 s	0...250 s	10 s
L1 Undercurrent	Disabled	0.2...45 A	—	0.1...25 s	1.0 s	0...250 s	1.0 s
L2 Undercurrent	Disabled	0.2...45 A	—	0.1...25 s	1.0 s	0...250 s	1.0 s
L3 Undercurrent	Disabled	0.2...45 A	—	0.1...25 s	1.0 s	0...250 s	1.0 s
L1 Overcurrent	Disabled	0.4...270 A	—	0.1...25 s	1.0 s	0...250 s	1.0 s
L2 Overcurrent	Disabled	0.4...270 A	—	0.1...25 s	1.0 s	0...250 s	1.0 s
L3 Overcurrent	Disabled	0.4...270 A	—	0.1...25 s	1.0 s	0...250 s	1.0 s
L1 Loss	Disabled	—	—	0.5...25 s	0.5 s	0...250 s	1.0 s
L2 Loss	Disabled	—	—	0.5...25 s	0.5 s	0...250 s	1.0 s
L3 Loss	Disabled	—	—	0.5...25 s	0.5 s	0...250 s	1.0 s
Comm Fault	Disabled	—	—	—	—	—	—
Comm Idle	Disabled	—	—	—	—	—	—
Remote Trip	Disabled	—	—	—	—	—	—

Table 8: Warning Summary

Warning Function	Warning Enable Factory Default	Warning Level Settings		Warning Delay Settings		Inhibit Time Settings	
		Range	Default	Range	Default	Range	Default
Ground Fault	Disabled	0.02...5 A	2.0 A	0.0...25 s	0.0 s	0...250 s	10 s
L1 Undercurrent	Disabled	0.2...45 A	—	—	—	0...250 s	1.0 s
L2 Undercurrent	Disabled	0.2...45 A	—	—	—	0...250 s	1.0 s
L3 Undercurrent	Disabled	0.2...45 A	—	—	—	0...250 s	1.0 s
L1 Overcurrent	Disabled	0.4...270 A	—	—	—	0...250 s	1.0 s
L2 Overcurrent	Disabled	0.4...270 A	—	—	—	0...250 s	1.0 s
L3 Overcurrent	Disabled	0.4...270 A	—	—	—	0...250 s	1.0 s
L1 Loss	Disabled	—	—	—	—	0...250 s	1.0 s
L2 Loss	Disabled	—	—	—	—	0...250 s	1.0 s
L3 Loss	Disabled	—	—	—	—	0...250 s	1.0 s
Comm Fault	Disabled	—	—	—	—	—	—
Comm Idle	Disabled	—	—	—	—	—	—
Remote Trip	Disabled	—	—	—	—	—	—

Table 9: Parameter Group Listing (Cat. No. 193-EC4)

Monitor Params	Reset / Lock	Advanced Setup	DeviceNet Setup	Output Setup	DeviceLogix
1 L1 Current	26 Trip Reset	24 Trip Enable	55 AutoBaudEnable	65 OutA Pr FitState	79 Comm Override
2 L2 Current	53 Program Lock	25 Warning Enable	56 NonVol Baud Rate	66 OutA Pr FitValue	80 Network Override
3 L3 Current	54 Set to Defaults	35 GF Inhibit Time	58 COS Mask	67 OutA DN FitState	81 Net Outputs
10 GF Current	103 Test Enable	36 GF Trip Delay	59 Output Assembly	68 OutA DN FitValue	82 Net Out COS Mask
14 Trip Status	104 Clear Queue	37 GF Trip Level	60 Input Assembly	69 OutA DN IdlState	
15 Warning Status		38 GF Warn Level	61 Assy Word0 Param	70 OutA DN IdlValue	
16 Trip Log 0		83 IN 1 Assignment	62 Assy Word1 Param	71 OutB Pr FitState	
17 Trip Log 1		84 IN 2 Assignment	63 Assy Word2 Param	72 OutB Pr FitValue	
18 Trip Log 2		85 IN 3 Assignment	64 Assy Word3 Param	73 OutB DN FitState	
19 Trip Log 3		86 IN 4 Assignment		74 OutB DN FitValue	
20 Trip Log 4		89 GF Trip Inhibit		75 OutB DN IdlState	
21 Device Status		101 # of Starts		76 OutB DN IdlValue	
22 Firmware		102 Operating Hours			
23 Dev Config		105 GF Warn Delay			
90 Warn Log 0		106 GF Sensing Range			
91 Warn Log 1		107 UC Inhibit Time			
92 Warn Log 2		108 L1 UC Trip Level			
93 Warn Log 3		109 L1 UC Trip Delay			
94 Warn Log 4		110 L1 UC Warn Level			
95 Elapsed Time		111 L2 UC Trip Level			
96 Starts Counter		112 L2 UC Trip Delay			
		113 L2 UC Warn Level			
		114 L3 UC Trip Level			
		115 L3 UC Trip Delay			
		116 L3 UC Warn Level			
		117 OC Inhibit Time			
		118 L1 OC Trip Level			
		119 L1 OC Trip Delay			
		120 L1 OC Warn Level			
		121 L2 OC Trip Level			
		122 L2 OC Trip Delay			
		123 L2 OC Warn Level			
		124 L3 OC Trip Level			
		125 L3 OC Trip Delay			
		126 L3 OC Warn Level			
		127 LL Inhibit Time			
		128 L1 Loss Trip Delay			
		129 L2 Loss Trip Delay			
		130 L3 Loss Trip Delay			

Table 10: Parameter Group Listing (Cat. No. 193-EC4), Continued

TripWarn History ❶	Trip Snapshot ❶
132 Trip History 0	144 SS L1 Current
133 Trip History 1	145 SS L2 Current
134 Trip History 2	146 SS L3 Current
135 Trip History 3	148 SS GF Current
136 Trip History 4	
137 Warn History 0	
138 Warn History 1	
139 Warn History 2	
140 Warn History 3	
141 Warn History 4	
142 TripHistory Mask	
143 WarnHistory Mask	

❶ Series C (FRN 5.00 and Higher)

Short-Circuit Ratings

ATTENTION



To prevent electrical shock, disconnect from power source before installing or servicing

ATTENTION



Select the motor branch circuit protection that complies with the National Electrical Code and any othergoverning regional and local codes

The Bulletin 193/592 E3 Overload relay is suitable for use on circuits capable of delivering not more than the RMS symmetrical amperes listed in the followign tables:

Table 11: Standard Fault Short-Circuit Ratings per UL 508 and CSA 22.2, No. 14

Cat. No.	Max. Available Fault Current [A]	Max. Voltage [V]
193-EC_B, 592EC_T	5000	600
193-EC_D, 592EC_C	5000	
193-EC_E, 592EC_D	10000	
193-EC_F	10000	
193-EC_G	18000	
193-EC_H	42000	
193-EC_Z	5000	

Table 12: High Fault Short-Circuit Ratings per UL 508 and CSA 22.2, No. 14 with Bulletin 100-C and 100-D contactors

Cat. No.		Contactor	Max. Starter FLC [A]	Max. Available Fault Current [A]	Max. Voltage [V]	Max. Class J or CC Fuse [A]
193-EC1 193-EC2 193-EC3 193-EC4 193-EC5	_B	100-C09	9	100000	600	20
		100-C12	12			20
		100-C16	16			30
		100-C23	23			30
	_D	100-C30	30			50
		100-C37	37			50
		100-C43	43			70
	_E	100-C60	60			80
		100-C72	72			100
		100-C85	85			150
	FF, ZZ	100-D95	95			200
	FF, ZZ	100-D110	110			200
	FF, ZZ	100-D140	140			250
	GF, ZZ	100-D180	180			300
	GG, ZZ	100-D210	210			400
		100-D250	250			400
		100-D300	300			500
	HG, ZZ	100-D210	210			400
		100-D250	250			400
		100-D300	300			500
	JG, ZZ	100-D300	300			500
		100-D420	420			600

Table 13: High Fault Short-Circuit Ratings per UL 508 and CSA 22.2, No. 14 with NEMA contactors

Cat. No.		Contactor Size	Max. Available Fault Current [A]	Max. Voltage [V]	Max. UL Fuse [A]		Circuit Breaker/Limiter
					R	J	
592-EC1 592-EC2 592-EC3 592-EC5	_T	00	100000	600	—	20	—
	_C	0	100000	240	30	30	FDB 3025/ LFB3070R
				480	30	30	FDB 3025/ LFB3070R
				600	30	30	—
	_C	1	100000	240	60	100	FDB 3050/ LFB3035R
				480	30	50	FDB 3050/ LFB3035R
				600	30	50	—
	_C	2	100000	240	100	200	FDB 3100/ LFB3150R
				480	60	100	—
				600	60	100	—
	_D	3	100000	240	200	350	FDB 3150/ LFB3150R
				480	100	200	FDB 3125/ LFB3150R
				600	100	200	FDB 3100/ LFB3150R

Table 14: IFC Short-Circuit Ratings per EN60947-4-1

Cat. No.	Prospective Short-Circuit Current I_r [A]	Conditional Short-Circuit Current I_q [A]	Max. Voltage [V]
193-EC_B, 592EC_T	1000	100000	690
193-EC_D, 592EC_C	3000		
193-EC_E, 592EC_D	5000		
193-EC_F	10000		
193-EC_G	18000		
193-EC_H	30000		
193-EC_Z	1000		

Fuse Coordination

Table 15: IEC Type 1 and Type II Fuse Coordination with Bulletin 100-C and 100-D Contactors per EN60947-4-1

Cat. No.		Contactor	Max. Starter FLC [A]	Prospective Short-Circuit Current I_r [A]	Conditional Short-Circuit Current I_q [A]	Max. Voltage [V]	Type I with Class J Fuse [A]	Type II with Class J Fuse [A]
193-EC1 193-EC2 193-EC3 193-EC4 193-EC5	_B	100-C09	9	1000	100000	600	20	15
		100-C12	12				20	20
		100-C16	16				30	30
		100-C23	23				40	40
	_D	100-C30	30	3000			50	50
		100-C37	37				50	50
		100-C43	43				70	70
	_E	100-C60	60				80	80
		100-C72	72	100			100	
		100-C85	85	150			150	
	FF, ZZ	100-D95	95	10000			200	200
		FF, ZZ	100-D110				110	200
	FF, ZZ	100-D140	140				250	250
		GF, ZZ	100-D180				180	300
	GG, ZZ	100-D210	210				400	400
		100-D250	250				400	400
		100-D300	300				500	500
	HG, ZZ	100-D210	210				400	400
		100-D250	250				400	400
		100-D300	300				500	500
	JG, ZZ	100-D300	300				500	500
		100-D420	420				600	600

Table 16: Type 1 and Type II Fuse Coordination with NEMA Contactors

Cat. No.	Contactor Size	Max. Starter FLC [A]	Prospective Short-Circuit Current I_r [A]	Conditional Short-Circuit Current I_q [A]	Max. Voltage [V]	Type I with Class J Fuse [A]	Type II with Class J Fuse [A]
592-EC_T	00	9	1000	100000	600	20	20
592-EC_C	0, 1	18, 27	3000			30	30
592-EC_C	2	45	3000			60	60
592-EC_D	3	90	5000			200	200

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